A Method for Weaving Curved Warp Yams and a Woven Fabric

Technical Field

The present invention relates to the method for weaving curves on shuttle woven fabrics in the field of textile art.

Background art

Shuttle woven fabrics are means of livelihood and means of production widely used by mankind nowadays. They have wide applications in the field of clothing face fabric, decoration cloth mat6rials and cloth used by the industries. The conventional shuttle woven fabrics follow all along the art requirement of perpendicular crossing of warp (longitudinal direction) and weft (transverse direction) and the cloth is woven by means of coordinative operation of five motions of warp let off, shedding, weft insertion, weft beating-up and take-up of the weaving machine. Especially all the current conventional metal reeds adopt vertical dents, all reeds dents are the same length, all metal reed dents are arranged in paralleled upright (of straight) direction and the density is all the same. The metal reed is fixed by the slay during the motion of Weft beating up, the metal reed is not allowed to have any looseness.

The Structure of the current weaving machine is shown in Fig.1. It includes, loom beam 11, back beam 12, warp Stopping blade 13, heddle frame 14, reed blade 15, weft insertion device 16, take-up wheel 17, guiding roller 18, cloth roller 19. Shuttle woven fabrics (also called woven fabrics or fabrics for short) are sheet like complex interwoven by warp 100 (longitudinal length) parallel to cloth edge and weft 200 (transverse width) perpendicular to cloth edge according to a regular rule. The principle for forming the fabric is :The loom beam 11 is located in the lower part at the back of the weaving machine on which are wound parallel warps. The loom beam is driven by warp let-off unit. After the warp 100 is sent out from the loom beam 11, it rounds the back beam 12, penetrates into the warp stopping blade 13 of the warp broken-end. Stop motion, the heddle 6 on the heddle frame 14 and the reed blade 15 of the metal reed. The weft 200 is guided into the shed by the weft insertion unit 16 (shown in the Fig.1 is a shuttle) and the fabric 10 is formed at the shed. Afterwards, the fabric, drawn by the t8ke-up wheel 17, P8sses through the guiding roller 18, and finally is wound on the cloth roller 19.

The above mentioned current weaving method and equipment make the outer appearance of the woven fabric rather dull, that is, all warp and weft cross into right angle crossed state, all warp and wed on cloth face side present straight line crossing, with all transverse lines being horizontal and all vertical lines being straight, and the density being the same. Therefore the design and the color of the fabric is limited in a certain degree.

Summary of the Invention

In order to overcome the monotony of the current loom woven fabrics, the present invention aims to provide a kind of curve weaving method for shuttle woven fabrics and to provide fabric products. Such method, with new texture and ingenious designs, enables the woven f9brics to have the curved strip shape pattern of orderly sparseness and denseness which can upgrade the grade of the products by means of simple process.

The technical scheme adopted by the present invention has the following steps:

a) Straight and slant warp let-off; by means Of the cooperation of the warp let-off unit of the weaving machine, feeding the warp on the loom beam to the cloth tell of fabric, the fed quantity of the warp matches the take-up quantity required by the take-up unit. During the course of feeding warp, the lifting and descending unit draws the metal reed with vertical and slant dents the spacing between which is variable to make up and down reciprocating movement and to make the warp restricted by the slant reed blade of the metal reed to form the slant line state with respect to the fell of cloth, in which state, the slant (inclined) degree of the warp varies, and the warp will be sent to the fell of cloth of the fabric in the straight and slant line state.

b) Shedding : the warp is divided into two upper and lower layers according to the process conditions of the fabric by the shedding unit of the weaving machine to form a rhombus shed and the shed thus formed makes the alternating up-down movement to provide the space for weft insertion.

c)Weft insertion: under the action of the weft insertion unit, the wed insertion device inserts the weft between the two layers of warp which have formed into a rhombus shed.

d) Beating up by lifting and descending movement : beating up the weft into

the fell of cloth by means of the lifting and descending motion of straight vertical and slant dent metal reed mounted in the sliding groove of the slay and by making the forward and backward sector swing following the slay.

e) Take-up : the take-up unit draws the fabric away from the fell of cloth.

In the above-mentioned method, the lifting and descending range (amplitude) and the lifting and descending speed of the lifting and descending mechanism can be varied according to the process requirement.

A kind of warp curve fabric of shuttle woven fabric, its feature is that the woven fabric product is woven by the slant line let-off warp and the weft which are in a non perpendicular crossing manner, the said warp presents a gradually and orderly varied curve arrangement in the fabric. The outward appearance of the fabric presents an obvious or hidden curve pattern.

In the above-mentioned warp curve fabric of shuttle woven fabric, the warp and the wed are raw materials of various textile fibers, their colors may be the same or different one from the Other.

A kind of special equipment for weaving warp curve fabrics, its feature is that it includes the lifting and descending component which is connected to the metal reed on the weaving machine and the driving component for driving the lifting and descending component; the said metal reed is a reed with straight and slant dents the spacing between which is variable.

This metal reed with straight and slant dents the spacing between which is variable includes reed balk, reed blade and side reed crosspiece, said reed balk consists of upper reed balk and lower reed balk, multiple reed blades are respectively fixed in a slant or vertical manner between the upper reed balk and the lower reed balk, there are two side reed crosspieces which are situated on the two ends of the metal reed and are fixed respectively between the upper reed balk and the lower reed balk, the said driving component is disposed between the lifting and descending component and the cloth roller of the weaving machine.

In the above-mentioned special equipment for weaving warp curve fabrics, the said reed with the straight and slant dents the spacing between which is variable is formed by the combination of multiple dent segments, the reed blades of each dent segment are arranged in a manner of sparseness and denseness from top to bottom or in a manner of sparseness and denseness from bottom to top. There are multiple reed blades disposed upright in each dent segment. The reed blades which form each such dent segment are arranged as straight-slant dent sparseness and denseness combination form, there is also a sliding groove which is fixed on frame of the machine, and the two ends of the metal reed with straight and slant dents the spacing between which is variable are disposed in the said sliding groove and can lift or descend in the sliding groove.

In the above-mentioned special equipment for weaving warp curve fabrics, there is still a bush mounted on the loom swing shaft and the lifting and descending component is fixed on the bush.

In the above-mentioned special equipment for weaving warp curve fabrics, the lifting and descending unit may consist of a lifting and descending mechanism in which the lifting and descending speed and travel distance can be changed.

In the above-mentioned special equipment for weaving warp curve fabrics, the said driving component is a chain type driving mechanism, its driving chain wheel is mounted on the cloth roller of the weaving machine, and the driven chain wheel is mounted on the bush of the loom swing shaft.

The present invention features the new structure, it can weave fabrics with Curve patterns having orderly sparseness and denseness, especially, the warp direction color strips on the face side of the dyed-yarn woven fabric have the graceful Curve form state and it can be used on currently available weaving machines having shuttle or without shuttle, it can upgrade markedly the rank (grade) of the products.

Brief Introduction of the Accompanying Drawings

The concrete structure, performance will be further described in details by the

following embodiments and the accompanying drawings. Among the drawings :

Fig. 1 is a schematic view of the prior art weaving machine.

Fig.2 is the schematic texture view of the first embodiment of the fabric product according to the present invention.

Fig.3 is the schematic texture view of the second embodiment of the fabric product according to the present invention.

Fig. 4 is a schematic view of a photo-print copy Of the fabric product according to the present invention.

Fig. 5 is a structure schematic view of the special equipment for weaving warp curve fabrics.

Fig. 6 is a side view viewed from E-E direction of Fig. 5.

Fig.7 is a schematic view of the structure of the metal reed with straight and slant dents the spacing between which is variable adopted by the present invention.

Fig.8 is a schematic view of the Structure of another steel reed with straight and slant dents the spacing between which is variable adopted by the present invention.

The Preferred Embodiments of the Present Invention

The method for weaving warp curve fabrics according to the present invention including the following steps :

a) Straight and slant warp let-off; by means of the cooperation of the let-off unit of the weaving machine, feeding the warp into the shedding member of the weaving machine, the fed quantity of warp matches the take-up quantity required by the take-up unit. At the same time, the lifting and descending member draws the metal reed with the straight and slant dents the spacing between which is variable to make it to do up and down reciprocating movement and to make the warp restricted by slant reed blade of the reed to form slant line state with respect to the fell of cloth of fabric in which state the inclination degree varies relative to the fell of cloth. The straight-slant warp let-off and the forming of straight and slant warp is due to such process that the straight and slant dent metal reed mounted in the sliding frame on the slay is drawn by the metal reed lifting and descending unit to make it to do up-down reciprocating movement, thereby to make horizontal line position of the beating up unit of the metal reed plane and the

fabric fell of cloth (fixed position) to move up and down reciprocatingly. During such movements, the warp restricted by the slant dents of the metal reed produces slant line movement with varied degree of slope, so that the warp restricted by metal reed slant dents and the warp of the fabric fell of cloth form, relative to the fabric fell of cloth, the straight-slant line state with varied slope degree. The warp let-off unit, which matches the weaving process and take-up quantity feeds the warp to the fabric fell Of cloth according to the straight and slant line state.

b) Shedding : The warp is divided into two upper and lower layers by the shedding unit of the weaving machine according to the process conditions of the fabric to form a rhombus shed and the shed thus formed makes the alternating up-down movement to provide the space for weft insertion.

c) Weft insertion: under the action of the weft insertion unit, the weft insertion device inserts the weft betw6en the two layers of warp which have formed into a rhombus shed.

d) Weft beating up : beating up the weft into the fell of cloth by means the straight and slant dent metal reed mounted in the sliding groove of the slay, said metal reed makes forward and backward sector swing following the slay.

e) Weaving (the warp restricted by the reed blades of the metal reed having different slope degree makes limited up and down reciprocating lifting and descending following the metal reed under the driving of the lifting and descending device and makes off-center slant line movement with different degree, so that, when beating-up the weft into the fell of cloth, the weft is all along in the different horizontal positions, making the warp and weft to present the state of crossing but not perpendicular to each other, thereby completing the weaving of warp curve fabric.

f) Take-up : the take-up unit draws the fabric away from the fell of cloth. The lifting and descending range and speed of the above mentioned lifting and descending member can be changed according to the requirement of the process. Please refer to Fig. 2 and Fig. 3, in which are shown the schematic views of first and second embodiments of warp curve fabric according to the method of the present invention. The fabric products are woven by slant line let-off warp 100 and weft 200 which are crossing but not perpendicular to each other. The colors of the warp 100 and weft 200 may be the same or different. The warp 100 is arranged in a

curve of gradual change and orderly manner. The outer appearance of the fabric presents a clear or hidden pattern 300. The direction of the arrow in the Figs indicates warp direction.

Fig. 4 is a schematic view of photo-offset copy of the woven product according to the present invention.

Please refer to Fig.5 and Fig.6, in which a special equipment for weaving warp curve fabrics according to the above-mentioned method of the present invention is shown, it includes the lifting and descending unit 32 which is connected to the metal reed 31 of the weaving machine and the driving unit 33 which drives the lifting and descending unit.

The special equipment includes also a sliding groove 34 and a bush 35. The sliding groove is fixed to the frame (not shown). The two ends of the reed with the straight and slant dents the spacing between which is variable are disposed in the sliding groove and can slide up and down in the sliding groove 34. The bush 35 is mounted on the swing shaft 37.

The lifting and descending unit 32 of the present invention adopts the lifting and descending mechanism in which the speed and travel distance can be changed. In the embodiments, a cam type lifting and descending mechanism is adopted. The cam type lifting and descending mechanism 32 includes a pair of step-up gearing 321 and a lifter rod 322 connected to the step-up gearing.

The step-up gearing 321 includes a cam 3211 connected to the bush 35 and a driven wheel 3212 engaged with the cam 3211. One end of the lifter rod 322 is connected to the output shaft of the driven wheel 3212, and the other end is connected to the slay 36. In order to locate the lifter rod, the special equipment of the present invention includes also a support bracket 4. One end of the support bracket 4 is fixed on the swing shaft 37 of the weaving machine, the other end has a hole, the lifter rod 322 passes through the hole and can make up and down movement.

The driving unit 33 of the present invention is arranged between the lifting

and descending mechanism 32 and the cloth roller 38 of the weaving machine. In the embodiments, the driving unit 33 is a chain type driving mechanism, the driving chain wheel 331 of which is mounted on cloth roller 38 of the weaving machine, the driven chain wheel 332 is mounted on the bush 35 of the swing shaft of the weaving machine and they are driven by the chain between them. This structure can make use of the powder generated by the rotation of the cloth roller 38 which power can be transferred to the bush 35 connected to the driven chain wheel via the chain, then the power can be transferred from bush 35 to the cam 3211 to finally make the lifter rod 322 to move up and down reciprocatingly. This structure can save energy source and can make the whole structure of the weaving machine to be simpler.

Please refer to Fig.7. The metal reed of the present invention is a reed with straight and slant dents the spacing between which is variable.

It includes an upper balk 311, a lower balk 312, reed blades 313 and side reed cross piece 314. The reed blade 313 is a kind of multiple blades. The multiple blades are respectively inclinedly and vertically fixed between the upper balk 311 and the lower balk 312. There are two side reed crosspieces 314 which are located on the two sides of the reed blades 313 and are respectively fixed between the upper balk 311 and the lower balk 312.

The reed blades 313 of the reed with the straight and slant dents the spacing between which is variable of the present invention has a plurality of dent segments 3131. The reed blades of each dent segment is arranged according to a manner of sparse space on upper part and dense space on lower part or sparse space on lower part and dense space on upper part and the reed blades of each dent segment have at least one vertical blade 313a. The reed blades of the reed with the straight and slant dents the spacing between which is variable are formed by a plurality of sector dent segment 3131 which are arranged as sparse spaced on upper part, dense spaced on lower part or sparse spaced on lower part, dense spaced on upper part, the two neighboring dent segments are arranged orderly with two opposite directions complementary with each other, that is, one dent segment is in upright sector form, the neighboring dent segment is arranged in inverted sector form, the

upright and the inverted dent segments are complementary. For example, a dent segment 3131a with sparse space on the upper part and dense space on the lower part is alternately arranged with a dent segment 3131b with sparse space on the lower part and dense space on the upper part. The curve fabric woven by the above mentioned metal reed on the weaving machine is shown in Fig.2.

Fig.8 shows the other kind of metal reed with the straight and slant dents the spacing between which is variable in which each set of reed blade dent segments 3131 arranged from vertical upright dent reed blade 313a and slopes gradually or the first reed blade of each sat of reed blades can be made vertical, and the rest reed blades are arranged gradually scattered according to a manner of sparse on upper part, dense on lower part or sparse on lower part, dense on upper part. The curve fabric woven by such type of metal reed on weaving machine is shown in Fig.3.

The operation principle of the special equipment of the present invention is: when the weaving machine works, during beating-up, the straight and slant dents the spacing between which is variable is made to move up and down reciprocatingly relative to the slay, therefore the warp restricted by the different positions of the reed slant dents produces warp straight-slant state of different degrees, resulting in non perpendicular crossing when the warp and weft are entered into the fell of cloth, thereby longitudinal curve strips are formed in the warp scope which passes through each dent segment slant reed. During weaving, each dent segment forms a complete pattern by a single up and down reciprocating movement. In the present invention, because the diversity of the specifications of the metal reed with the straight and slant dents the spacing between which is variable (including reed number, sparseness/denseness ratio, straight and slant dents ratio, dent segment width, etc) and the different arrangement of the process condition of the travel distance of the lifting and descending cam and the speed of change gearing, the variation of the state of the pattern of the curve fabric can be without limit.

Industrial Applications

In the fabrics woven by means of the present invention, a part or the whole

part of warp presents non perpendicular crossing with the weft, and viewed from the outer appearance of fabric, the warp of the cloth face side presents orderly bending state. With the warp being arranged in a complementary varied sparseness and denseness manner, the face side of the cloth can produce obvious or hidden graduated shade or clouding patterns which have excellent curve states, thereby it can significantly upgrade the grade of the products and increase the added value and capacity of competition of the product.